

user may use for example the thumb finger for gestures to signal an input or command while holding device 100 at the same time for mobile applications allowing the other hand to be free. Gestures may be stored in a gesture library or database in storage device 110.

**[0038]** In addition to gestures, tracking an object relative to display device 302, as provided in an example in FIG. 5, may be used for drawing purposes. A user may use a finger to draw in air a character or shape that is detected by ultrasound source/detector 125 and rendered into an image by one or processors 102. This feature may be useful, for instance, in computer games, toys, or graphics applications.

**[0039]** In FIG. 3, part of an on screen virtual or simulated keyboard displayed on display device 302 provides the letter "E" key having an elevated substantially square ultrasound 308 provided to an object at location points 206, 208, and/or 210. Although part of a virtual or simulated keyboard is shown, display device 302 can be configured to show a whole QWERTY keyboard, a numeric keypad, or a combination of a whole QWERTY keyboard and a numeric keypad, as desired. The letter "S" key is provided by a partially displayed portion and an elevated substantially circular ultrasound 310. The virtual or simulated keyboard may also be programmed to replicate Braille lettering, as desired.

**[0040]** As an example, for letters "Q" and "A" ultrasound 306<sub>1</sub> and 306<sub>2</sub> are projected around the perimeter or edges of the keys to define boundaries so that a user may type the correct key and can find or feel the correct position of the keys. For displayed letters "Q" and "A" a user may type the key by physically touching display device 302. The touch input is detected by touch detectors 124.

**[0041]** In one embodiment a pull away motion of an object from display device 302 may be detectable as a capital or superscripting letter input while a push motion in the direction towards the display device may indicate subscripting of the letter. In response to a detected motion, haptic feedback, force feedback, or tactile feedback in the form of a played sound, gyration, or vibration may be provided via I/O controller 116.

**[0042]** Referring to FIG. 4, chart 400 shows an example of how ultrasound focal or control point strength or intensity units may be varied over time to provide different sensations to a user's finger, hand, or any other object. For instance, as a user pulls a finger away from display device 302, which is detected by ultrasound source/detector 125, strength or intensity units may be reduced by elevation, indenting, or texturizing controller 121. Conversely, when the finger is pushed towards display device 302 strength or intensity units may be increased for a predetermined period creating a virtual feeling of resistance.

**[0043]** In addition to inputting information via on screen virtual or simulated keyboard shown in FIG. 3, display device 242 may project ultrasound as shown in FIG. 2f. Ultrasound transducer, source, or detector cells 244 may project onto zone 246 so that the user's view of display device 242 is unobstructed. Zone 246 may be projected onto a table or desk giving the user the ability to use the space as an input area similar to that of a keyboard or mouse. A special pad 248 may be used to reflect or vibrate in response to ultrasound from transducer, source, or detector cells 244.

**[0044]** Referring again to the virtual or simulated keyboard on display device 302, instructions in software 108 can be used to predict or anticipate keystrokes. Prediction or anticipation may be based on a word or sentence entered. In

response to the anticipation, a different key may emit ultrasound to a user's finger, hand, or any other object to encourage or invoke input and provide context awareness.

**[0045]** An embodiment of the present invention may provide enhanced electronic advertising processes. Advertisement 316, such as an adword by Google, can be sold to an advertiser for a certain price for having elevated substantially circular ultrasound 317 on at least one part or the entire advertisement image or photo. Advertisement 318 can be sold to an advertiser for a different price, higher or lower, for having elevated substantially circular ultrasound 318<sub>1</sub> and 318<sub>2</sub> each projected at a different intensity in comparison to substantially circular ultrasound 317. In addition, the strength or intensity of substantially circular ultrasound 317, 318<sub>1</sub>, and 318<sub>2</sub> may be dependent on location determined by GPS device 114 and varied over time as shown in FIG. 4.

**[0046]** Advertisement 316 or 318 may be provided in a separate pop up window with the emitted ultrasound to an object at location points 206, 208, and/or 210. The emitted ultrasound may be provided only for a predetermined time period after the pop up window is displayed thereby providing a nudge or feeling sensation to the object. As the pop up window emerges the intensity of ultrasound to the object may be increased over time prior to turning off thereby simulating the effect of the pop up window virtually emerging from display device 302.

**[0047]** With advertisement 316 or 318 in a separate pop up window, or for any another application in a window, a user may interact with an operating system by moving windows, grabbing windows, dragging windows, or dropping windows. Substantially circular ultrasound 317, for instance, may provide to a user's fingers a sensation by projecting multiple focal or control points when the user virtually tries to grab a window shown on display device 302. As the user moves a window, a slight vibration is provided by substantially circular ultrasound 317. A strong vibration may be provided by substantially circular ultrasound 317 when running into obstacles or boundaries on the screen. The vibration may stop when the user releases the window, as desired.

**[0048]** An embodiment of the present invention may provide electronic commerce processes. A "Buy Now" button is provided with an elevated substantially circular ultrasound 322<sub>1</sub> and an elevated substantially square ultrasound 322<sub>2</sub> to an object at location points 206, 208, and/or 210. The "Buy Now" button is associated with triggering the purchasing of displayed shirt 324 by sending a request to a server (not shown) over one or more network adapters 128. For shirt 324, ultrasound texturizing pattern 326 is provided to virtually replicate or simulate the surface or composition of shirt 324. Ultrasound texturizing pattern 326 can be a combination of different ultrasound focal or control points. Although a shirt 324 is shown, ultrasound texturizing pattern 326 can be used to provide surface information for any product being sold or displayed on display device 302.

**[0049]** Using touch detectors 124 in combination with elevation, indenting, or texturizing controller 121, displayed shirt 324 can be highlighted and then rotated in response to a multitouch input while ultrasound texturizing pattern 326 is dynamically changed to virtually reflect the different surfaces or materials used to make the shirt. Shirt 324 can be zoomed in and out using multitouch inputs detected by touch detectors 124 with each zoom level reflecting texture differences on ultrasound texturizing pattern 326. For instance, a zoomed in view may be more grainy or rough compared to a zoomed out